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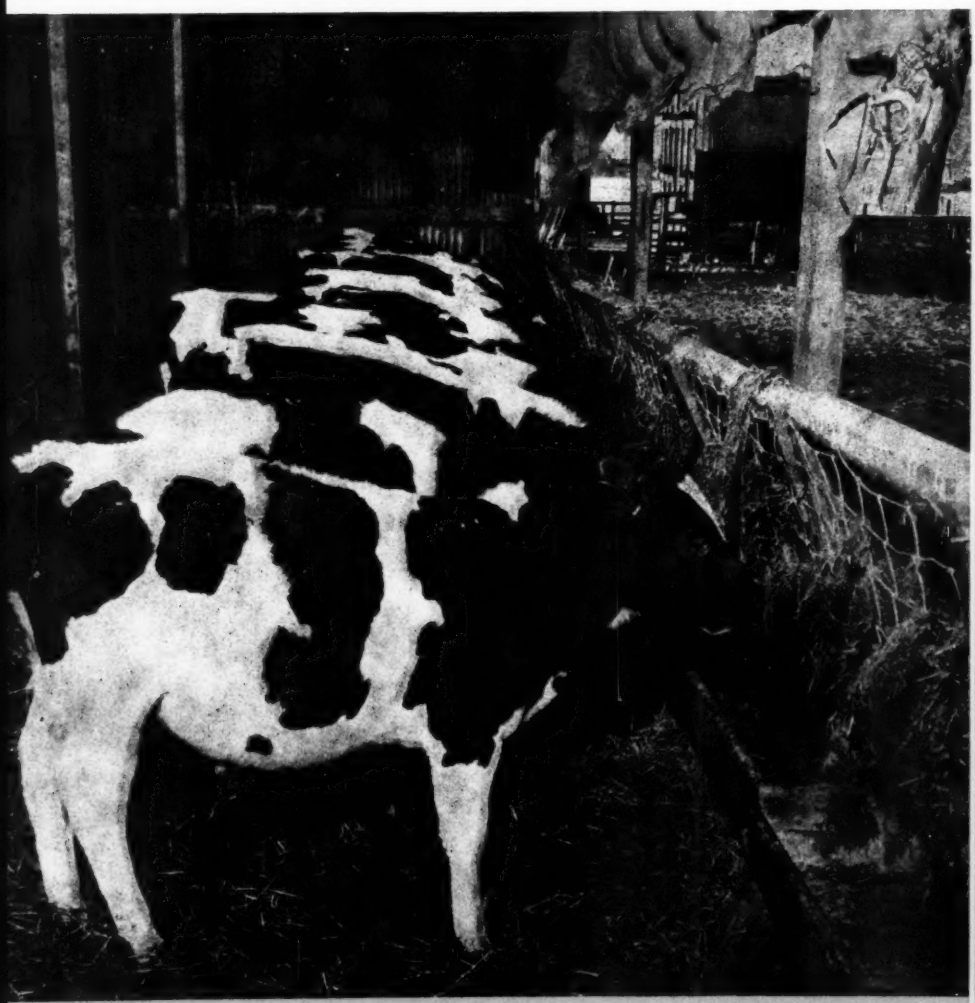

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British Wild Mink

— a challenge to Naturalists

Harry V. Thompson

THERE is a widespread, but mistaken, enthusiasm for moving wild animals about the world and releasing them in new habitats. Such introductions are frequently damaging to man's economy and may be disastrous to other species. A good example is the virtual replacement in England and Wales of the native red squirrel (*Sciurus vulgaris*) by the North American grey squirrel (*Sciurus carolinensis*) during this century.

Spread

In earlier articles in *Agriculture* (December 1964 and March 1967) the development of European fur farms and the subsequent escapes of the North American mink (*Mustela vison*) were described. Feral mink are known to have bred in Britain since at least 1957 and to have killed hens, pheasants, domestic ducks, waterfowl and other birds. This led to all mink farms being brought under control in 1962 by the Mink (Importation and Keeping) Order, made under the Destructive Imported Animals Act 1932. But by 1962 it was evident that mink were established on several rivers in England and Wales. Information about them has been collected by Ministry officers throughout the country and is summarized in the table and on the distribution map shown on page 423.

Table

Mink caught in the wild, England and Wales

	pre-1961	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	Total
England	119	90	162	199	275	780	720	862	813	519	187	4,726
Wales	4	4	14	45	17	9	54	54	66	32	—	299
Total	123	94	176	244	292	789	774	916	879	551	187	5,025

The annual catch rose sharply in 1965, largely as the result of a special effort to limit the spread, an effort which began on 1st April 1965 and continued for five years, during which time nine trappers were engaged. The numbers caught remained at a similar level for the next three years and then declined as the intensity of the trapping was gradually reduced. Mink were found to be more widespread in southern England and Yorkshire and Lancashire than had previously been believed and it became clear that, although local control may be achieved, the continued spread into suitable habitat throughout the country was probably unavoidable.

Natural history

Although over 5,000 mink have been caught in the past decade, it must be realized that they are still very thinly and patchily distributed. In Sweden the American mink, also introduced in the 1920s, occurs throughout the country except in the northern mountains, and some 20,000 a year are caught by hunters. I do not have a figure for the annual catch of wild mink in North America, but the muskrat is its principal food and can seldom be in short supply; the United States' statistics for 1966 indicated that nearly five million muskrat pelts reached the fur trade.

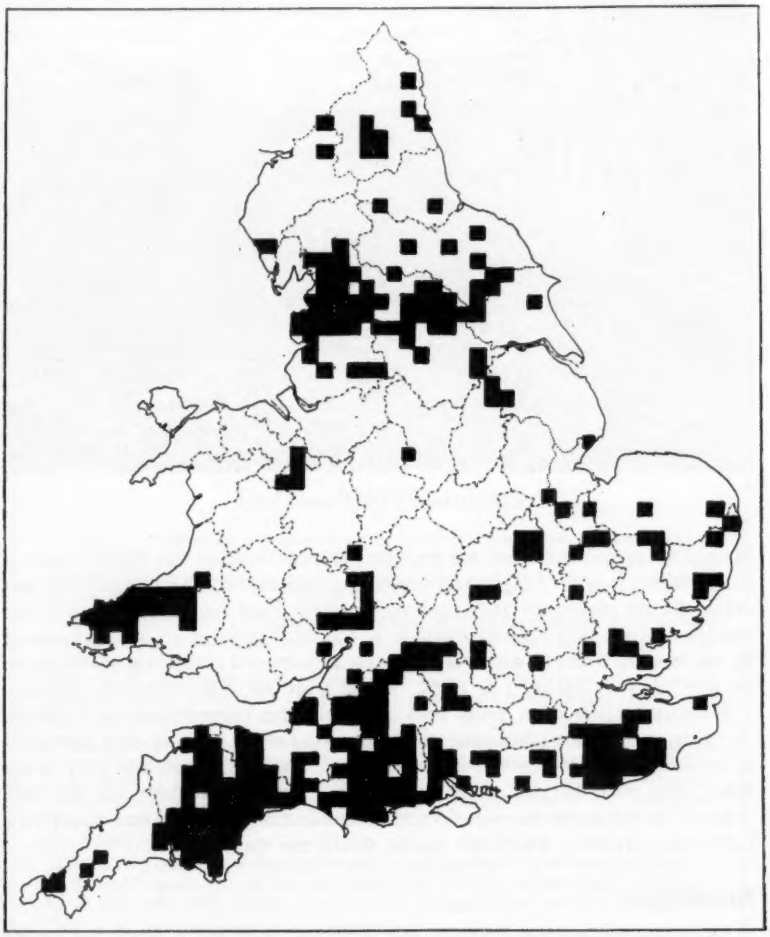
Since mink are still relatively scarce in Britain they are seen only occasionally in the wild, mainly by anglers, river keepers, naturalists and other countrymen. A few are run over by vehicles or caught by hounds and a number are trapped, mainly in cage traps. There is still a great deal to be learned about the mink in Britain, although some preliminary studies of food habits, based on material collected during the official trapping work, are in press. Ranch mink, from which all our wild ones are descended, have been bred in a variety of colours from brown to beige, blue, cream and white. The highly coloured mutants may be found in the wild but the standard or natural dark-brown animal is the most common, usually with a whitish chin patch which varies individually. A male ranch mink may weigh 6–7 lb but the largest out of a thousand wild mink handled in the Ministry's laboratory was a male weighing 4 lb and measuring 26 in. from nose to tail tip.

Mink are usually associated with water and live along rivers and on the edges of marshes and lakes. But they are adaptable, will tolerate disturbance and live away from water if food is abundant. More terrestrial than otters, mink nevertheless swim well, having partly webbed feet, and can swim under water for at least 15 yards. They climb with agility and have been seen 50 ft above ground in trees.

Food habits

As we know from observations made in Sweden and Norway, the mink in Europe, as in its native America, has catholic food habits; although our

information is more limited, the same is true in Britain. It is the availability of prey that is important to any facultative predator. In much of North America, and some parts of Russia, muskrats are abundant and a basic mink food. In Sweden there are seasonal variations of diet according to the availability of prey; crayfish (*Astacus astacus*) are eaten mostly in the summer, fish in winter and spring, birds most frequently during migration and breeding seasons, while rodents are a variable source of food owing to the marked fluctuations in their numbers. In Britain there is little doubt that birds, especially moorhen and coot, mammals such as young rabbits, voles and rats, and fish are the main constituents of mink food. The occasional predation on poultry and young game birds attracts public attention and it is rather surprising that freshwater fishery interests appear to have been little disturbed by mink so far.



Map showing distribution of mink in England and Wales, 1960–70

Activity studies

Relatively few observations of mink have been made in Britain, although they have been seen at all times of the day, and no marking studies have been done. Most of our knowledge of the behaviour of the American mink in Europe is attributable to the work of Dr. Rune Gerell, at the University of Lund, Sweden. Over a period he fitted six wild caught mink with collars incorporating a minature, pulsed-signal radio transmitter and tracked their movements continuously, day and night, with mobile receiver units until the transmitter's batteries expired after about 14 days. Of the six mink, five were males and one was female, while one of the males was a ranch mink which had been at liberty for some two to three months. All the wild males were

Wild mink

mainly nocturnal at all seasons and their level of activity was directly related to increasing length of night and decreasing temperature. The female was less active during pregnancy and much more active when suckling, when she was mainly diurnal. The activity rhythm of the feral ranch mink was influenced by the feeding times to which it had been accustomed and it was more active by day than by night. The mink ranged over variable distances, between 1 kilometre ($\frac{5}{8}$ths of a mile) and 11 kilometres (approximately 7 miles). Apart from avoiding places exposed to the wind when hunting, they appeared to be little influenced by weather conditions. The most important prey in the study area were fish and rodents; small cyprinids and percids and the field vole (*Microtus agrestis*), wood mouse (*Apodemus sylvaticus*) and water vole (*Arvicola terrestris*), which are mainly nocturnal mammals.

Breeding

Domestic mink mate between late February and early April but under free-living conditions this may be affected by environmental factors. Owing to

delayed implantation, parturition in ranch mink is in early May and pregnant wild mink have been found in England during the first few days of May, while there are several reports of parties of adults with from 2 to 6 young being seen in June and July. Dens have been found in tree trunks, holes and crevices among stones. The young are weaned after eight weeks, attain adult size in about four months and can breed the following year.

Impact on native fauna

With the continuing spread of mink there is need for much more information on their ecology. Further studies of food habits, particularly analyses of scats as well as digestive tracts, would be valuable, as would observations on behaviour, particularly in relation to potential competitors—otter and polecat—and predators such as the fox and buzzard or other predatory birds. For some years otters have declined in numbers in several areas; although pollution may be partly responsible for this, otter hounds did kill mink in the Kendal district in 1968 and otters are reported to have left places where mink have become established. It has also been reported from Sweden that otters may not breed where the mink population is dense, and from Russia that there is competition for food between mink and otter in some areas. There have been several cases in England where moorhens have disappeared from a habitat after the arrival of mink and naturalists should be alert to the spread of mink into new localities.

Harry V. Thompson, B.Sc., F.I.Biol., is the Head of the Land Pests and Birds Research Department of the Ministry's Pest Infestation Control Laboratory at Worplesdon, Surrey.

Outdoor Pig Production

A report * on Outdoor Pig Production in South and South-east England has been published by the School of Rural Economics and Related Studies, Wye College (University of London). The report is based upon surveys of some 45 producers during 1968 and 1969.

After a study of the technical and economic information obtained from surveys of outdoor pig producers in the region, the report concludes that the profitability of this type of enterprise compares very favourably with that of more intensive methods of production. Such an enterprise appears to constitute a worthwhile break for cereal production and to form a useful part of the arable rotation on many farms.

This study is the fourth in the series of co-ordinated economic investigations commissioned by the Ministry of Agriculture, Fisheries and Food which are being undertaken by university departments of agricultural economics and published under the title 'Agricultural Enterprise Studies in England and Wales'. The views expressed and the conclusions drawn in the report are not necessarily those of the Ministry.

*Copies of *Outdoor Pig Production: Report on an Economic Investigation*, by Michael A. B. Boddington, can be obtained from the Publications Secretary, School of Rural Economics and Related Studies, Wye College, Wye, Ashford, Kent, price 75p.

An in-line forage harvester

Silage Making Systems

G. E. Amos

FOR two main reasons farmers have shown an increasing interest in recent years in planning high output systems of silage-making.

First, rising production costs have made producers more conscious of the need to conserve high quality fodder. To obtain the optimum combination of yield, digestibility and protein content it is important to start when the grass is at the stage of ear emergence, or even before, and conserve the crop as quickly as possible. Both quality and uniformity of silage will be influenced by the system of silage making employed. A quickly filled, consolidated and sealed silo will result in reduced losses and a more uniform fermentation.

The second main reason is that the Central Council for Agricultural and Horticultural Co-operation have encouraged the formation of silage-making groups by offering the incentive of a 33⅓ per cent grant on purchased equipment; 470 such groups have been formed in Britain during the past two seasons and silage tonnage has increased by almost 25 per cent since 1967. This scheme has drawn attention to the advantages of group silage-making with high output systems; consequently the trend towards these systems has continued in spite of the withdrawal of grant for the 1971 season.

Choosing a system

Output is the main criterion in the choice of a system which should be capable of clearing the acreage in about ten days. Thus 80 acres of silage per cut would require a system capable of ensiling a minimum of 8 acres per day.

There are other considerations which influence the choice of high output systems:

Availability of machinery and capital

On the small farm labour is usually the resource that limits an increase in system output. Also, in this situation it is more difficult to justify capital inputs in new, high output, equipment. Large tractors are an example of this. In these circumstances group co-operation can be particularly attractive.

Wilting or direct cutting

Most evidence suggests that quickly made and well sealed silage is likely to be of better feed value when made from wilted rather than unwilted material. Other advantages of wilting to, say, 25 per cent D.M. are the reduction of effluent and a potential increase in output.

Length of chop

The length of ensiled grass affects trailer load weights, ease of handling, consolidation and feeding. A short chop length can make handling easier and improve silage quality but unless short-chopped silage is required for complete mechanized handling, as in a tower silage system, the choice between a flail harvester and a double chop or metered-chop machine is not always easy. More information is required on the effects of different machine combinations on chop length and laceration and the effect of these on feeding value.

Systems

Three main systems, and some of their variations, are described below. The outputs are based on crop yields of 10 tons per acre at 20 per cent dry matter and on transport distances of one-quarter to one-third of a mile. The wilted systems assume a 10 per cent increase in dry matter percentage. Normal and target outputs are given as a guide.

One Man System

This is a useful system for farms with small acreages and limited labour.

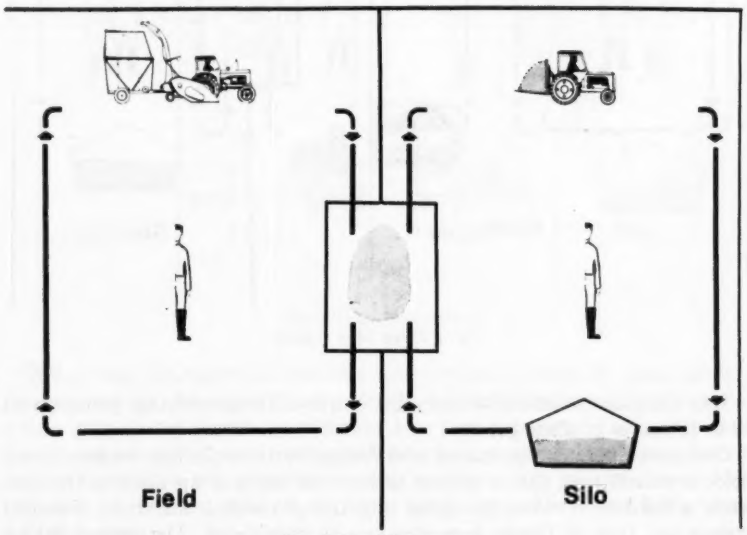


Fig. 1 One Man system

One man operates the tractor and harvester to fill and transport the trailer to the silo. When sufficient loads have been tipped there, the same man then buckrakes the accumulated grass into the silo.

A side mounted or in-line harvester can be used. The side mounted machine is the more manoeuvrable and is more suitable for working in small fields and on sloping land. When a trailer is full, the harvester is detached from the tractor and left in the field while the trailer is hauled to the silo. In-line machines are permanently attached to the tractor so that time spent in hitching and unhitching the harvester is saved. These machines are, however, less stable on wet sloping fields and can be difficult to manoeuvre at the clamp. The system output per 8-hour day would be:

	Tons	*Acres*
Target	30·0	3·0
Normal	20·0	2·0

If two men with tractors are available, the first man can continue forage harvesting throughout the day while the second does the buckraking part-time. The output of a system of this type falls off sharply as haulage distance increases above approximately 300–400 yards.

Three Man System

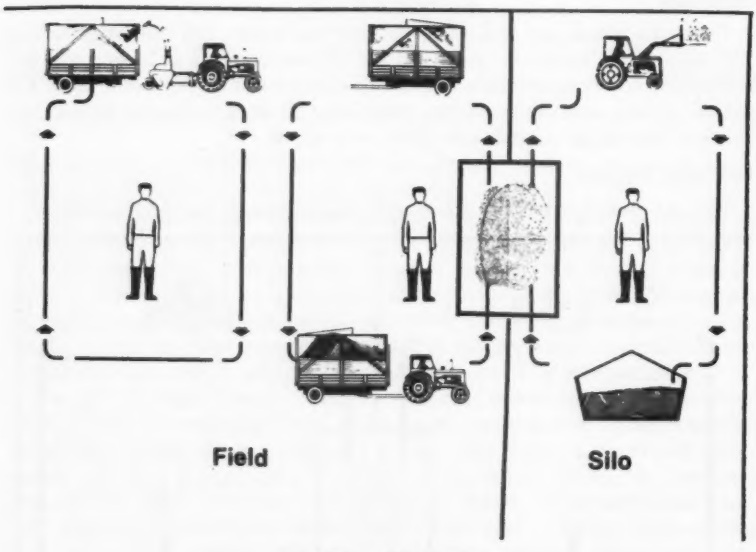


Fig. 2 Three Man system

This is a system suitable for many medium sized farms or forage groups with 80 to 100 acres of silage per cut.

One man operates the tractor and forage harvester, filling trailers in the field; a second man uses a tractor to haul trailers and tip them at the silo, while a third man moves the grass into the silo with a buckrake. For this system any type of forage harvester can be considered. The output for an

eight-hour day under this system is:

	Tons	*Acres*
Target	100	10
Normal	80	8

Unfortunately a wilting stage is not easily introduced into this system. However, it may be possible to pre-cut either early in the morning or during milking and meal times but there is a danger of delaying the picking up. Many pre-cutting machines, such as rotary and flail mowers, have outputs of 2–3 acres per hour but this still entails up to five hours pre-cutting per day.

One important advantage of wilting is the potential increase in system output in tons of dry matter and acres per hour. The potential effect on output by incorporating wilting in a three-man direct cut system is:

	Tons	*Acres*
Target	100	15
Normal	80	12

Four Man System

Where four men and tractors are available it is easy to introduce a wilting stage because pre-cutting can continue independently of the ensiling team.

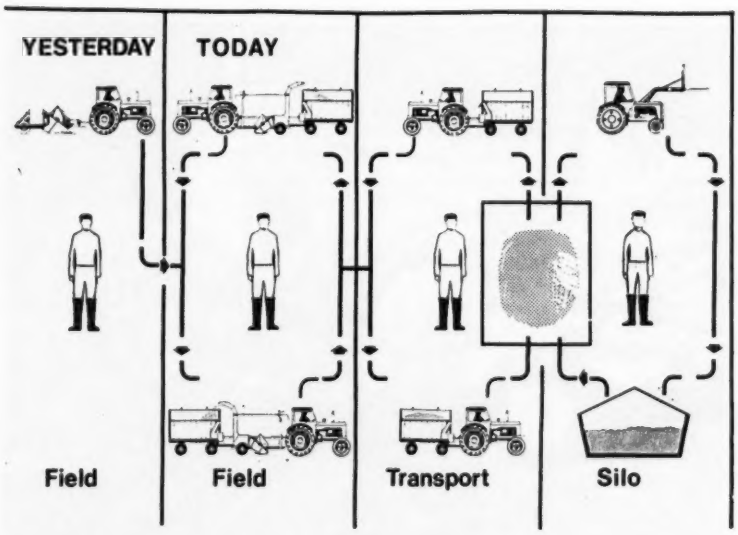


Fig. 3 Four Man system

When large tonnages are involved and outputs of over 20 acres per day are required it is advisable to pre-cut with a wide mower/conditioner or add a fifth man to the system to side rake two rows into one. This can almost double the acreage covered by the harvester in a working day. Metered chop forage harvesters are sometimes used in these systems since, provided sufficient power is available, their output can be up to 25 per cent higher than a flail machine.

Output variations

A number of factors can cause variations in system output:

Trailer Loading Rate

A system will achieve its maximum output when the forage harvester is working continuously and at full capacity. However, output is normally well below the harvester's potential. For example, with sufficient power, a simple flail harvester can achieve a net output of 20–30 tons per hour when direct cutting a 10 ton per acre crop but often the system output obtained is only 30 per cent of this. Sometimes, in a thin crop, the forward speed is insufficient to achieve high loading rates. In such cases windrowing or the use of a wide pre-cutting mower can overcome this.

Transport System and Organization

Limitations in the transport system are often the main cause of low system outputs. Hitching and unhitching trailers, turning and tipping at the silo can amount to 20 per cent, and in some cases even 30 per cent, of the total turnround time on a one-quarter of a mile haul. Automatic hitches and tailgates speed up the turnround time, and sideways loading into a trailer travelling alongside the harvester will eliminate the hitching and unhitching operation.

Front mounted push-off buckrake

The distance from field to silo and speed of travel determine the transport time. This is affected by ground conditions, the number of gateways and, in some situations, the trailer size, etc. To keep transport time to a minimum, the quickest route between field and silo should be chosen, although this may not necessarily be the shortest.

Trailer size, length of chop and silage dry matter percentage all influence the transport system. Large trailers can result in greatly increased output,

but can have serious disadvantages on hilly land when towed behind a harvester. For a given trailer size increasing the degree of chop by using a double chop instead of a simple flail harvester can increase trailer load weight by over 50 per cent. For this reason it is advisable to increase the degree of chop, especially when transporting wilted silage, to maximize trailer load weight and dry matter per load.

Filling the clamp

Ensiling is not normally a restriction to the output of a system as often there is room to tip additional trailer loads near the silo if necessary; conventional rear mounted buckrakes can achieve loading rates of up to 15–20 tons per hour when skilfully operated. At the extreme, a tractor with a front mounted push-off buckrake and an instant forward/reverse transmission, is capable of loading rates of 30–40 tons per hour. It is generally more satisfactory to use a narrow buckrake and handle small loads. This can reduce the handwork required to keep the silo level. Push-off buckrakes do not necessarily achieve higher loading rates than conventional types but they do give more accurate placing of the silage so that manual spreading is reduced. Some operators prefer front mounted buckrakes and these can be particularly useful where the silage face is built up high; although they are less tiring to use in some situations, traction and steering can be difficult.

A system to suit

Only the basic systems and equipment for making conventional clamp silage have been mentioned and there are many variations to suit particular circumstances. Every situation must be considered individually and the equipment should be chosen which is best suited to the acreage, labour force and handling method of the farm.

G. E. Amos, A.N.C.A.E., is a Mechanization Adviser with A.D.A.S., at Trawscoed, Aberystwyth.

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Apple and Pear Development Council

Fourth Annual Report

The Fourth Annual Report of the Apple and Pear Development Council has been published *. It records the activities of the Council during its fourth accounting period from 1st April 1970 to 31st March 1971.

The chief function of the Council is to publicize home-grown apples and pears with a view to increasing sales; its other activities include research into marketing, distribution and consumption.

*Obtainable from the Secretary, Apple and Pear Development Council, Union House, The Pantiles, Tunbridge Wells, Kent, price 20p (postage paid).

In soils of poor natural permeability the fissures which enable water to move freely down to the drains must be man-made by

Mole Drainage and Subsoiling

R. A. Walpole

PIPE drainage systems often need to be supplemented by mechanical operations which disturb the soil above them before they can function properly. It is no good putting drains in the ground unless the water can reach them and the deep operations of subsoiling or moling may be necessary to create this disturbance and improve the permeability of the soil. It has been found that the quickest discharges of water resulting from the under-drainage of agricultural land are from mole drainage systems. This is an interesting fact and obviously one that highly commends the use of this method of drainage, more particularly as it is often the most economic.

Both moling and deep subsoiling are regarded as secondary or supplementary drainage treatments. This is because they have similar aims, that of improving the permeability of the soil to get surface water quickly down to the drains. The decision as to which, if any, secondary treatments shall be used is influenced by the nature of the problem and the soil type. These factors, together with soil moisture conditions when the work is being carried out, determine the likely success of either of the operations.

Need for secondary treatment

The permeability of the soil depends upon two main characteristics, its texture and its structure. The texture is represented by particle size, ranging from coarse sand down to fine sands, silts and clays in that order of magnitude. The size of the particle determines the size of the pore space or void. The finer the pore space the more it restricts water and air movement. The soil structure is the way in which these particles are cemented together by various complex processes, chemical, biological or physical to form larger units or aggregates. The size and stability of the units of structure determine the degree of fissuring and cracking which is present in the soil and may be affected by such things as the proportion of organic material and the quality and quantity of clay.

As an example two extremes in soil type may be considered. First, the homogeneous coarse grained sandy soil in which the drainage problem is not one of permeability but merely a control of the ground water table. The material of the soil is uniformly graded, thus there is no problem of getting water to the drains as it can move freely through the voids between the soil particles. This controls the permeability of a soil and under these conditions there should be no need for a secondary treatment. At the other extreme is the homogeneous clay soil through which no water can pass at all. It is indeed a fact that water will not pass through raw clay. It can only pass through the

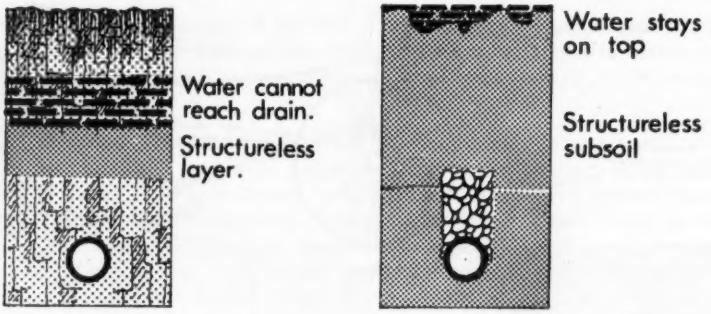


Fig. 1

cracks which exist in the clay itself. This illustrates the need for a good soil structure.

There is a wide range of soil conditions between these two extremes which restrict the permeability of the soil in various degrees and ways, either by a complete lack of fissuring or structure or by variations in particle size or texture which may occur at any depth above the drains. Compaction, loss or lack of structure, can arise throughout the full depth of the rooting zone of the plant or may exist in the form of an impermeable horizontal layer or stratum at varying depths. It is the consideration of these restrictive factors which requires an examination of the soil profile at depth before a decision is made on the type of drainage treatment needed. When evidence is displayed in the profile of characteristics which will create poor permeability above the drain the need for a sub-surface or secondary treatment is established (Fig. 1).

Moling

Because mole drainage can be so successful and economical it becomes the first to be considered; thus if soils and conditions are right for effective moling the scheme can be designed on this basis. Moling is intended to canalize subsoil water flow and so requires that the soil contains an optimum clay content and a moderate but not excessive plasticity to form a stable channel.

The mole plough. The principle of mole drainage is to form a well-defined circular underground channel in the clay which will then act as a drain and convey water to a more permanent outlet. Fig. 2 highlights the more important features of a long beam mole plough. Other types are also in regular use. The plough is so designed that the mole can be pulled into the subsoil and in this way form a smooth walled channel at a pre-determined depth, which is controlled by the setting of the blade. Fig. 3 shows how this operation also creates fissures in the surrounding soil; these radiate upwards away from the mole and form channels which facilitate the movement of water towards the mole drain. Moling is usually carried out at depths of 18, 21, 24 or 27 inches.

Design of underdrain pipe systems for moling. Mole channels are usually spaced 9 ft apart as this distance has been found to be optimum to provide adequate fissuring of the surrounding subsoil. It is not usual to allow for a

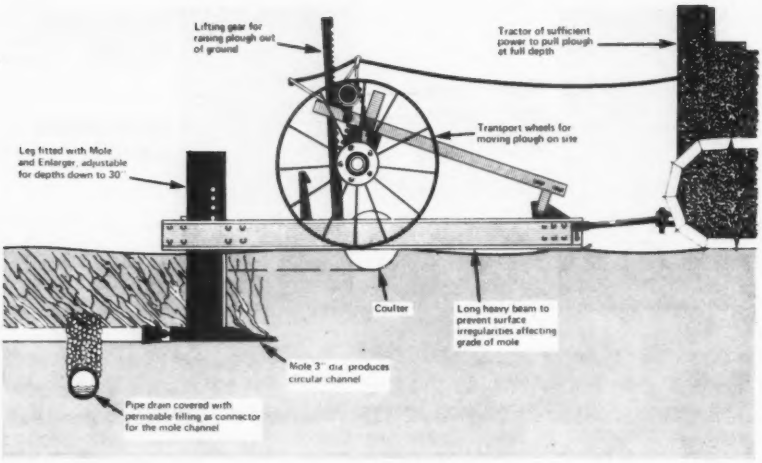

Lifting gear for raising plough out of ground
Tractor of sufficient power to pull plough at full depth
Transport wheels for moving plough on site
Leg fitted with Mole and Enlarger, adjustable for depths down to 30"
Coulter
Long heavy beam to prevent surface irregularities affecting grade of mole
Mole 3" dia produces circular channel
Pipe drain covered with permeable filling as connector for the mole channel

Fig. 2

greater spacing than this. Where the clay is naturally structureless there can be some advantage in reducing the spacing to 6 feet to increase the pattern of fissuring.

In the early years of mole ploughing, and even up to the 1940s, mole mains were pulled in by the mole plough at a lower level to collect the lateral mole channels. These mains were effective only for short periods except in very strong clay soils. The present day practice is for mole drains to be pulled approximately at right angles over piped mains covered with a permeable backfill material such as gravel or clinker laid to a depth of 6-inches above the base of the mole channel. This serves effectively to connect the mole channels to the pipe drains, thus not only providing more permanent outlets to the mole system, but allowing re-moling to be carried out when required.

Principles affecting design. The layout of the pipe mains takes into consideration the site circumstances. To ensure the success of the moling it is necessary to comply with certain basic principles. Failure to establish and conform with any one of these could lead to the breakdown of the system.

Some of the variations in site circumstances are dealt with below, showing their significance in deciding the different spacing, depth and location of mains, these being the collectors which control the uninterrupted length of mole channel. Whilst piping at every 4 or 5 chains is possible in a strong uniform clay it is often necessary to reduce this to 2 chains or less where soils and field circumstances are less favourable.

First it is necessary to decide on whether the texture of the subsoil is suitable to form a mole channel. Basically few problems exist at the higher limits of clay content. Normally a soil with a clay content of above 35 per cent is regarded as suitable, but sandy clays often have an inherent instability due to the proportion of coarser material which readily washes out with water movement. On the other hand, silty clay loams with a lower proportion of clay have given good results.

Uniform soil texture. This is essential at moling depth. If the stratum of clay is undulating it may be necessary to mole at a greater depth to ensure

that the channel is formed in the clay. This is particularly important where long lengths of mole channel are involved. Severe variations in texture at moling depth will need to be compensated by closer spacing in the underdrain mains.

Soil structure. This has been referred to as determining the permeability of clay soils and in this way it has a direct bearing on the efficiency of the mole drainage system. A stable structural development invariably indicates that a stable mole channel can be formed. An example of this is to be found on the chalky boulder clays. These are recognized as being very stable soils because of the high calcium carbonate content and, as a result, a fairly long length of mole channel can be formed satisfactorily. Four chains would be an optimum length.

Surface slope and its uniformity. These are fundamental considerations. If changes of gradient occur the channel should be protected by additional pipe mains at the lower limit of the change. It is necessary to allow a pipe main in the bottom of every depression. Flat gradients cause early siltation and where possible gradients of less than 1:300 should be avoided. Conversely too steep gradients cause erosion and collapse of the mole channel. A gradient of 1:30 should be regarded as the upper limit, but both these situations can be compensated for by siting the pipe mains more closely together so reducing the likelihood of failure by shortening the effective length of the mole channel.

Good outfall conditions. For the mole drainage system these are essential. The outfalls must always be able to discharge freely into the ditch. When mole channels are submerged even for only brief periods this can result in the collapse of the mole system. Because of this moling should be avoided in the flood plains of rivers and adjoining ditches where high water levels periodically occur.

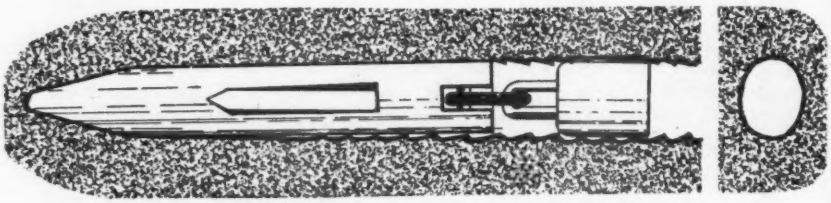
Soil moisture conditions. It is essential to establish that the correct soil moisture conditions prevail at the time the operations are carried out. The

Fig. 3

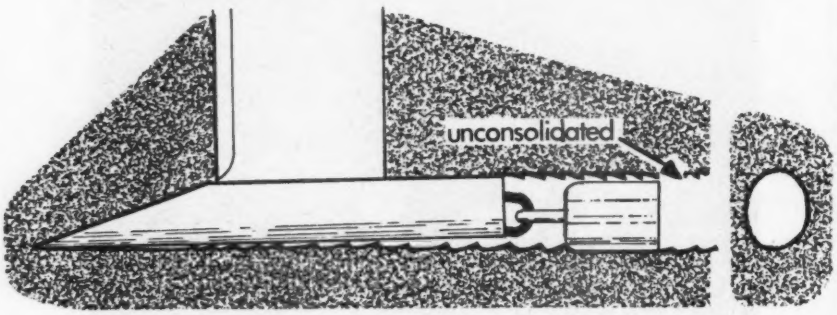
ideal conditions for moling can be described as when the soil is dry and firm on top and moist and plastic below. If too dry it becomes a soil bursting operation leaving a rough walled channel. If too wet the mole channels will be sealed and have only a comparatively short effective life. Ideally the mole channels should be drawn at a time of the year when they have an opportunity to dry out and set before being called upon for regular use. Thus late spring and early summer are usually the best times.

Moling areas. It follows that the mole plough is most commonly used in areas of heavy clay where the plough has been developed and its use has become traditional. There are many other areas in England and Wales with clays that are suitable for mole drainage and which would benefit from this form of drainage treatment. The clays need not be ideally suitable provided the pipe mains are designed to accommodate the variations in soil texture and other site circumstances. It is probable that with the co-operation of farmers and contractors a much wider area of clays could be mole drained.

Equipment and operators. Skilled operators using good equipment should always be employed. Fig. 4 shows how a badly set mole plough causes imperfect mole channel sections with rough channel walls and shallow moling depths. The alignment of the mole must always be parallel to the beam and the direction of pull. Worn or bent blades, mole and expanders should never be used.



Effect of twisted blade



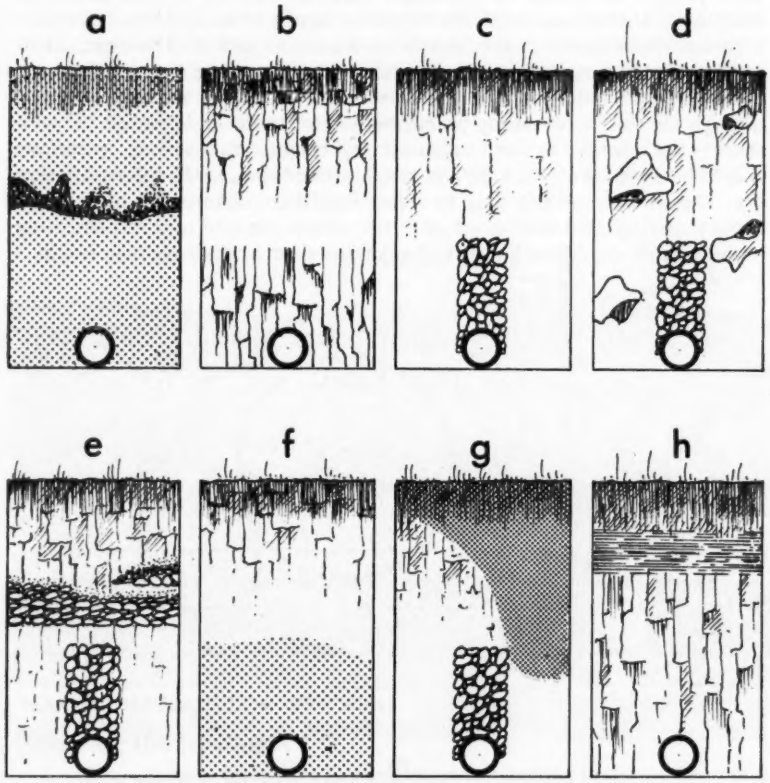
Effect of excess 'Lead'

Fig. 4

Cost. The cost of mole drainage over permeable filled pipe drains depends largely on the intensity with which the pipe mains are laid. For example, a scheme with mains laid at 4 chains apart could cost approximately £30 per

acre gross, whereas at 2 chains apart it would be £55 and at 1 chain apart up to £100. The higher cost would consist of an almost pure pipe system with secondary moling as a permeability aid.

In good conditions a sound moling system in a strong clay can last quite effectively for ten or more years, but the efficiency of the channel deteriorates with age. On the more variable soils mole drainage will not last nearly so long, but even with as little as a three-year life moling can be economically justified. The cost of re-drawing the moles over the underdrain pipes can be carried out for as little as £5–£6 an acre.



a Chemical or iron panning in coarse textured soils (sands or gravels)
b Structureless layer in fine textured soils (silts, clay/loams and clays)
c Massive soils–those with little or no structure (clays, silts and silty clays)
d Clay subsoil with occurrence of large stones or flints
e Indurated stony layers in a clay matrix
f Fine textured alluvial clays overlying ground water problems in coarser soils
g Undulating horizons of clay and coarser soils
h Mechanical compaction of fine textured soils

Fig. 5

Subsoiling

Mole drainage has been referred to as the most satisfactory method of draining clay soils but there are field conditions where moling cannot be

carried out successfully because the criteria for its proper installation cannot be met or where it has been found that there is some inherent weakness in the clay which prevents a stable mole channel from being formed.

Soil texture is not so important with subsoiling as even the coarsest soils have been known to have impermeable horizons of iron panning. Some of the circumstances where subsoiling rather than moling is indicated are illustrated in Fig. 5.

The subsoiler. As Fig.6 shows, the subsoiler is in many respects similar to the mole plough. It should have a single blade and a square or angular toe designed to shatter and to lift the subsoil at depths down to 24 in. It requires a powerful crawler or four-wheel drive tractor to pull it. The object is to break up impervious horizons in the subsoil or to create maximum fissuring and soil aeration to promote the movement of air and water downwards through the soil by increasing permeability. Unlike the mole plough the subsoiler is not intended to form a channel. It is essential that subsoil operations should be undertaken when the soil moisture conditions in the subsoil are very dry. This is essential not only to create maximum disturbance but also to avoid smearing. Excessive moisture in the subsoil can lead to severe smearing or even create slurry conditions and a deterioration in drainage may result.

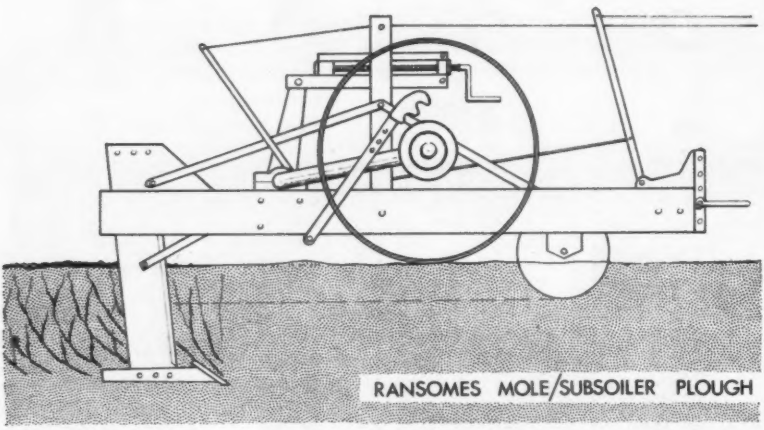


Fig. 6

Design of the system. Subsoiling must be related to the depth of the underlying problem and should be at least as deep as the base of the impermeable layer. Generally the work is carried out at right angles to the underdrains as in this way the maximum interception of water is obtained. Uniformity of field gradient is not so important as with mole draining because no defined channel is formed. Nevertheless it is advisable to position pipe mains at the bottom of major depressions, especially in heavy clay soils, otherwise the subsoiling will encourage even greater depths of water to accumulate, causing serious damage to the subsoil and the crop.

The use of permeable fill over the drains depends to a large extent upon the soil type. Where it is known that the subsoil is fairly coarse textured it may

be possible to dispense with backfill, but where doubt exists or where subsurface lateral flows are anticipated a permeable backfill should always be provided.

*Soil fissuring.*The object in subsoiling is to ensure that as far as possible all the soil above the drains is completely fissured. The extent of the fissuring on each side of the plough is therefore important, for to provide a complete coverage at the field surface where the rain water first falls the fissuring effect of each 'cut' with the plough should touch the area affected by the previous 'cut'. This is a crucial aspect in the operation as it is not always possible to determine the distance between the 'cuts' until the first run with the plough has been made, when the effect can be observed and the extent of the surface lifting and soil movement can be seen. The amount of disturbance is related mainly to the moisture content of the soil and the proportion of the clay. The distance apart for subsoiling is seldom more than 4 feet, i.e., to provide 2 feet of shattering on either side of the plough. As a rough guide the spacing can be related to the depth. The fissuring effect of the plough rises at approximately 45 degrees from the toe of the plough, thus subsoiling at 24 in. deep would join up with a 4 feet spacing (Fig. 7).

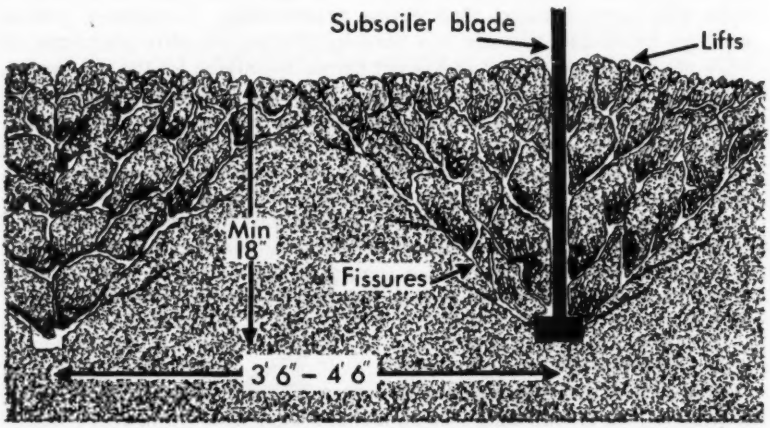


Fig. 7

Selecting the treatment

It will be seen that there may be some degree of overlap in the selection of a secondary treatment, particularly in clay soils, and a good deal depends upon the soil moisture conditions at the time the work is carried out. Before designing the drainage system establish the need, identify the problem and select the most suitable secondary operation if one is needed. For the best results use the best equipment and carry out the work under the right conditions.

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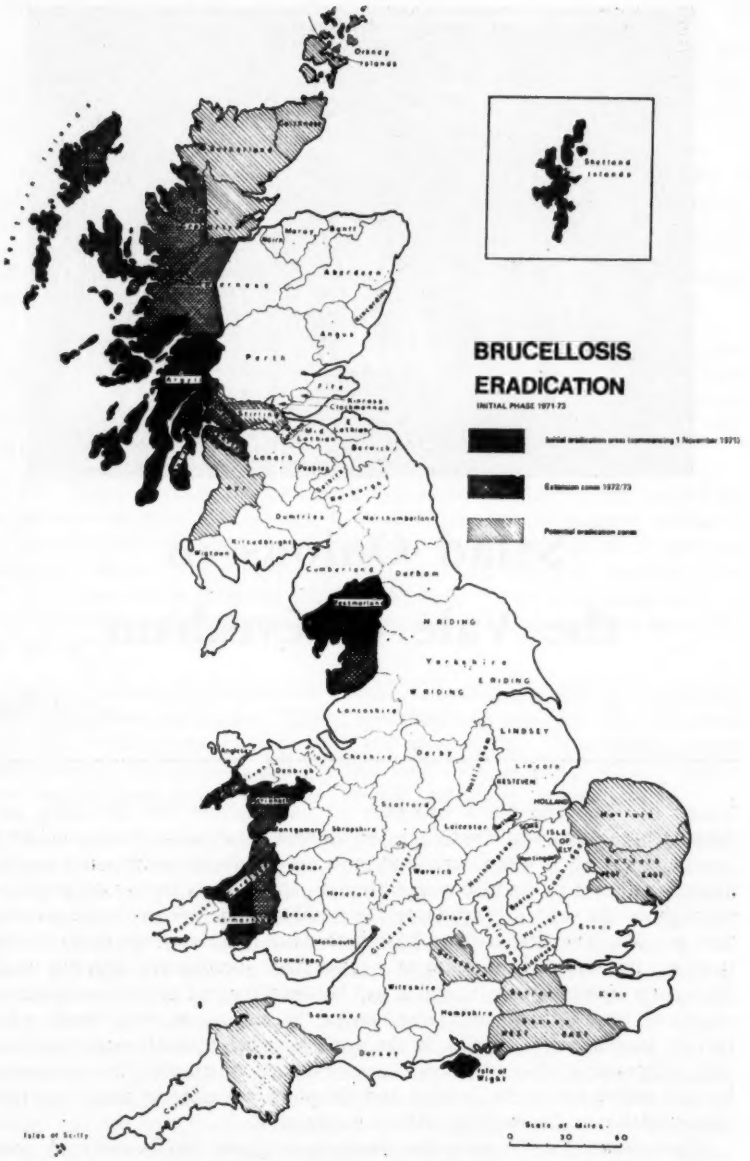
Brucellosis

In 1967 the Brucellosis (Accredited Herds) Scheme was introduced, the first of the schemes for voluntary accreditation. It was designed to build up a register of known brucella-free herds which would provide the reservoir of healthy animals needed to replace those animals which would have to be slaughtered when compulsory eradication was introduced at a later stage; and it was intended to attract clean or relatively clean herds. A programme of tests led up to the 'Official Test' after which, if clear, a herd was registered as Accredited. Some of the necessary tests were provided free of charge. Compensation was paid on reactors found at the 'Official Test' and after. By April 1970 some 16½ thousand herd owners were participating.

In 1969 it was announced that a start would be made in 1971 on area eradication. But first of all, in order to give further impetus to the process of voluntary accreditation which had begun with the original (Accredited Herds) Scheme, the Brucellosis Incentives Scheme was introduced in July 1970. This Scheme, rather than paying compensation on reactors, puts a premium on healthy animals in a herd by offering incentive premiums of 0·52p per gallon on milk or £1·87½ per animal qualifying for the hill cow or beef cow subsidy; payments continue for 5 years from the time the herd becomes accredited. The response to this Scheme has been very encouraging, in that in its first twelve months it has attracted some 27,000 applications, bringing the total number of herds in the two voluntary Schemes to over 40,000 at the end of July 1971. To encourage a still higher rate of voluntary accreditation, the Government announced at the last Annual Review that the levels of incentives were being increased to 0·8p (dairy) and £5 (beef). This should make the Incentives Scheme attractive to all except the most heavily infected herds and has helped to give a further boost to the application rate.

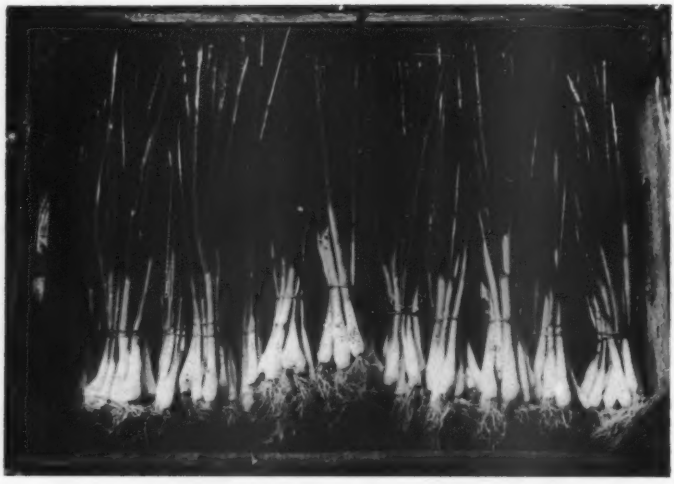
Area eradication

When the increases in the incentive rates for the voluntary Scheme were announced, the Government also announced its plans to begin area eradication in three main areas in Great Britain later this year. Compulsory testing will be carried out in those areas, and movement restrictions imposed, from November 1971. Area eradication terms will then be available on a voluntary contractual basis for the first twelve months but thereafter full compulsory measures will be applied. Under these terms owners will be required to slaughter animals which react to the official tests and will be paid a flat rate replacement grant in addition to the carcase value for each animal dealt with in this way. For reactors in herds which the owners have taken steps to protect either by use of the Free Calf Vaccination Service or by buying replacements from vaccinated or accredited herds, the replacement grant will be £30; for others it will be £15. Herd owners will also receive incentive payments at the same levels as for voluntary accreditation, but for a shorter period. The eradication programme will proceed on an area basis and already further areas have been named where eradication will begin in 1972/73. The selection of successive areas will depend mainly on the local response of the industry to voluntary accreditation.



Brucellosis eradication. Initial phase 1971–73

By encouraging owners to aim for voluntary accreditation and at the same time by providing special terms to deal with the more heavily infected herds in eradication areas, the Government, with the co-operation of the industry, is already well on the way to seeing this country free of brucellosis and of the hazards which it presents to human and animal health.



Salad Onions in the Vale of Evesham

A. J. Dyke

SALAD onions make heavy demands on hand labour for harvesting and preparation for market. For this reason the area grown on individual holdings is usually limited to a few acres and most are produced on intensive market gardens rather than arable farms. Although salad onions are usually available throughout the year, depending on the weather, there are two main production periods. The first is from March to May from sowings made in late summer, the second from June to August from successional drillings made from early spring. Often there is a gap between the end of the overwintered crop and the beginning of that sown in the spring. As with many other market garden crops, supplies in the peak periods frequently satisfy demand with a depressing effect on prices. Sometimes a proportion of the crop cannot be sold before the bulbs develop and the plant has gone to seed. It is then unmarketable and a complete loss to the grower.

Approximately 4,000 acres are grown in England and Wales each year, just over half of which are spring sown. Worcestershire is the most important growing county, producing some 21 per cent of the spring sown and 32 per cent of the overwintered crop. Nearly all the Worcestershire acreage is in the Vale of Evesham. Other main production areas are Kent, Cambridgeshire and the Isle of Ely, Bedfordshire, Essex and Surrey, which together form about 32 per cent of the total area. The acreage is almost static, although the spring sown crop has tended to increase in recent years.

Why the Vale of Evesham?

A number of factors combine to make the Vale of Evesham suitable for the successful production of salad onions, particularly the overwintered crop. These include climate, soil, site, available labour and, last but not least, the skill of the grower. Let us look at these factors in more detail.

Climate. First and foremost is the suitable climate. The average winter is mild but comparatively dry, enabling plants to overwinter in good conditions. Spring comes early, allowing early drilling. Winter injury to salad onions can take several forms: low temperatures kill the leaf tips which become affected with progressive rotting and mild damp weather can be equally damaging by encouraging Botrytis rot.

Soil. The main requirements of the soil for onion growing are good drainage and fine tilth. In the Vale of Evesham nineteen soil series and thirty-two textural types have been recognized. Not all of these are good for intensive market gardening. The sandy loams and, somewhat surprisingly, the well structured calcarious clays are suitable.

Site. This is perhaps the least important factor but there is no doubt that some sites are better than others. A southerly aspect will promote earliness; a naturally well ventilated site will produce plants less susceptible to Botrytis infection; shelter protects the crop from the worst effects of the wind. The Vale of Evesham is naturally sheltered by hills, not only the large mass of the Cotswolds to the east which rise above 1,000 ft, but also more local hills of 200–400 ft.

Labour. Labour, particularly of females, is readily available for harvesting and preparation for market. Pulling and bunching may take 500–700 hours per acre, washing and packing may add another 150. Consequently, there are relatively few holdings that produce large areas of salad onions because they require large gangs of workers to pull and bunch the crop.

The grower. Successful salad onion growing in the Vale of Evesham depends very much on the skill of the grower. He must be skilful in the execution and timing of his cultivations, particularly on heavy soils. In this he is not helped by the need to crop his land intensively, double cropping some of it. He must be shrewd in his choice of fertilizer, its quantity and time of application; too much nitrogen will produce a soft plant susceptible to disease, too little will retard growth. And in his choice and application of weed killer; if he fails in this he will not have labour available for hand weeding and the crop will be either severely checked or may have to be abandoned. He must also be competent in his choice of varieties and sowing dates to produce a succession of crops, the aim being to have the crop sufficiently developed to stand the winter but not so advanced that there is a large leaf area which could be damaged. If successful, a high proportion of his onions will survive the winter and bulk up to give a heavy yield in April and May. A proportion of his crop will be sown earlier and more thinly on his earliest soil in the hope of overwintering a somewhat larger plant. This will bulk up more rapidly to reach a marketable size in March, or even earlier in a favourable year. He will also sow a proportion of his acreage somewhat later, aiming to have plants just large enough to survive the winter. Development of these small plants in early spring will be further retarded by delaying the application of the top

Machine washing salad onions

dressing. This retarded crop should be marketable in the gap between the bulk of the overwintered onions and the first of those sown in the spring and it would then enjoy a scarcity value.

Preparation for market

One of the limiting factors in salad onion production is the huge labour demand for harvesting and preparation for market. It is usual for women to pull and bunch the onions in the field. The bunches consist of 10–15 onions, weigh about 3 oz, and are secured by rubber bands. In late May and early June, when onions are in short supply because most of the overwintered crops have been marketed but the spring sown ones are not yet available, larger and fewer onions in the bunch are acceptable in the markets. The bunched onions are loosely packed into boxes and removed from the field for washing. First they are placed in shallow water tanks, with the leaves above water, to soak and soften the soil adhering to the roots. Several methods of washing are used. Washing machines are becoming increasingly popular, particularly with the larger growers. For those who lack a washing machine the most popular method is to lay the bunches out in a single layer on an open mesh bench and wash the soil off with a hosepipe, after which they are left on the bench to dry.

The most usual market container is the second hand non-returnable Dutch tomato tray which holds four dozen bunches. Occasionally, covers bearing the growers name are used. After packing, the protruding leaf stalks are cut off level with the ends of the box to give uniform stem length. An alternative method of harvesting favoured by some of the larger growers and used more generally when weather conditions are bad is to pull the onions and to place them in boxes for subsequent bunching and washing under cover.

Selling

As with most market garden produce, the bulk of the salad onion crop is sent to wholesale markets. There are a number of transport firms in the

Evesham area which, between them, make daily runs to the primary wholesale markets in the Midlands, North, Wales and Scotland. The London markets are supplied mainly from Bedfordshire, Essex, Kent and Surrey. In addition, the growers co-operative marketing organizations sell directly to secondary wholesalers throughout the country. There are also merchants in the Evesham area who buy both standing and harvested crops for packing to customers individual requirements.

Demand is increasing from supermarkets and chain stores for continuous supplies of salad onions pre-packed to consistent quality standards. Production in the Vale of Evesham is most suited to meet this provided the price is sufficiently attractive. The climatic advantages of the Vale can be exploited from November to the end of June to produce late autumn, overwintered and spring sown crops. Skilled labour is available then to produce and market crops throughout the year and markets look to the Vale for their supplies. There is a similar demand for continuous supplies of other market garden crops, cauliflower for example, but the Vale of Evesham is less able to meet it.

Specialization

Increasing competition from farmer growers in the production of brassicas, legumes and root crops has forced market gardeners to specialize in those crops which cannot be readily grown and harvested on an extensive scale. It is not unusual to find growers in the Vale relying on salad onions for between a quarter and a half of their gross income. One of the side effects of specialization is that crop rotations are too short; land is too valuable to be rested in grass leys. Leeks, which belong to the same family and attract the same pests and diseases as salad onions, are also popular in the area—25 per cent of the England and Wales crop is grown in Worcestershire, most of it in the Vale of Evesham. Because the choice of site and soil is critical for salad onions, the areas on individual holdings which are suited to their production are often extremely limited. The most serious effect of close rotations is the build up of the soil-borne fungus disease White Rot (*Sclerotium cepivorum*) which can remain in the soil for eight years or more between susceptible crops—the fungus rots the roots and the base of the bulb preventing further growth and rendering the plant unsaleable. The disease cannot be eliminated from the soil, but crops can be grown in infected soil following seed dressing with Calomel (mercurous chloride).

To most people, the salad onion is of interest only for its pungent smell and flavour. But for several hundred growers and their families it is no exaggeration to say that their livelihoods depend on this humble vegetable. Fortunately for them, our affluent society is likely to eat more salads and the salad onion is a crop which is likely to remain in the hands of the small grower for a long time to come.

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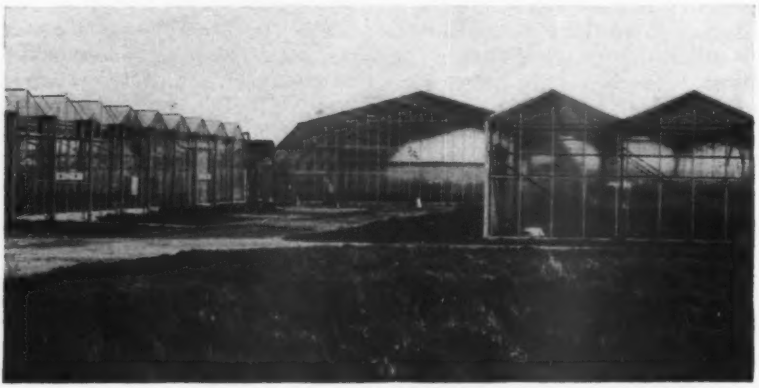
A revised version of Advisory Leaflet No. 358 Salad Onions, which deals with the cultivation, etc. of the crop, will be available shortly. Its issue will be announced in the Ministry Publications section in a future issue of *Agriculture*.

Supplementary lighting can be more costly than making the best use of

Natural Light in Glasshouses



Multispan structures orientated east-west and north-south and east-west orientated clearspan house with Mansard shaped roof

R. F. Harnett, *Efford E.H.S.*

In this article the expression 'light' refers to the total radiation entering the earth's atmosphere. Less than half this solar energy is used in the major function of providing energy to manufacture carbohydrates from CO_2 in the process of photosynthesis, most of the remainder being responsible for photoperiodic response and the process of transpiration.

Geographical factors

The concentrated areas of glasshouses built in Britain around the turn of the century were chosen for easy access to the big markets. The Lea Valley supplied Covent Garden; Blackpool much of the North; and the Clyde Valley, Scotland. In the early 'thirties, Dutch growers set up many holdings in the Hull area and there is a good deal of Dutch light glass, in many modified forms, to be seen around that area today.

The Worthing area and Guernsey both have claims to the first commercial development. Growing grapes in the first instance, both areas expanded in the 1870s probably because of the favourable climate which made forcing reasonably easy. Although possibly not realized in the early years, the South Coast and the Channel Isles have the added benefit of the best natural light available in the British Isles. In England, the Worthing district has today the most concentrated area of glass and since World War II the spread has been along the Sussex and Hampshire coastline.

In Table 1 the amount of light received on the South Coast is compared with that in the West Riding of Yorkshire.

Table 1.

Comparison of light received
South Coast and West Riding of Yorkshire

	South Coast	Yorks W. Riding
January	14	8
February	24	16
March	42	36
April	67	56
May	95	80
June*	100	95
July	97	89
August	78	67
September	58	47
October	40	30
November	17	14
December	13	8

*The average daily June figure for the South Coast is 500 gm cal cm^2; taking this as 100 the other months are expressed as a percentage of this.

As further reference will be made to units it should be noted that one unit equals one per cent in the above table or 5 gm cal cm^2.

The length of day and the position of the sun in winter gives only 8–14 per cent of the light received during the long days in June. During the early weeks of the year light is improving by nearly 20 per cent on the week preceding. It is generally accepted that light is limiting up to around 20 units per day and above 40 units per day much of it is not of use to plants. From October to March, therefore, forcing crops under glass is limited by the natural light. Although the South Coast receives appreciably more light than the West Riding of Yorkshire, the difference is only relative and both regions lack light for 5–6 months of the year.

Supplementary lighting

How, then, can crops be grown in the light conditions available? Over many years grower have accepted the light conditions and adjusted temperatures to give best results. Supplementary lighting by the use of mercury fluorescent lamps or fluorescent tubes has been used widely for a number of years. The ultimate will be an entirely controlled environment with a known artificial light input. The cost of providing light in this way is at present prohibitive for all but small areas or for propagation purposes where plants are close together. To give artificial light over an area of an acre at a level of one unit would consume 1,800 kW electricity per day using mercury fluorescent lamps for twelve hours, and the capital cost of the lamps would be £7,500.

Wood or metal superstructure

Natural light is further reduced by structural and cladding material designed to protect crops from the vagaries of the weather. The level of light transmitted into a house varies between types of structures and the way the

ridges are orientated. Fifty years ago the prime importance in structural design was the durability of the wood and the size of the glass available. The early vineries in Guernsey, for example, were built by skilled shipwrights who incorporated very heavy timbers in the superstructure. Glass has been the normal cladding until recently but it may in time be replaced by rigid or thin film plastic. Table 2 shows the amount of light transmitted by a typical 30 ft wide wooden structure glasshouse (Vinery) orientated north–south and designed in the 1950s compared with a modern east-west orientated metal structure with a clear span of 60 ft.

Table 2

Light transmitted during winter by house types and situations

House type and situation	Percentage of total light transmitted					
	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
North-south Vinery	55	51	50	51	52	56
East-west Clearspan	69	70	70	70	70	69
	Units* of light transmitted					
	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
SOUTH COAST						
North-south Vinery	20	9	6	8	12	25
East–west Clearspan	25	12	8	10	16	31
YORKS W. RIDING						
North–south Vinery	15	7	4	5	10	22
East–west Clearspan	18	10	5	6	13	27

*One unit = 5 gm cal cm^2

The increase in transmission between the two types of houses in December and January is 40 per cent but, because of the very low total light at this time, the difference in the absolute amount of light reaching the plants is not very great, bearing in mind that a total of 20 units per day is required for normal growth. As it was not known whether this small increase in light gave improved crop yield or quality, four one-quarter acre glasshouses of modern design were built at the Ministry's Efford Experimental Horticulture Station. Commercial growers have for some time been unsure whether to build a wide clearspan giving a high light transmission but at an increased cost over the slightly poorer light-transmitting but cheaper multispan structure. The photograph on page 449 shows two multispan structures at Efford orientated east–west and north–south and an east–west orientated clearspan house with a Mansard shaped roof.

Tomato prospects

Experiments started in November 1969 with an early-sown tomato crop and the programme has been repeated in 1970/71. Although it is too early to reach firm conclusions, there is an indication that economically the more expensive house is not justified for tomato cropping where the growing programme can be arranged to suit a particular site and structure. Observations made at Efford during the six year period 1965–70, growing the tomato cultivar Eurocross BB, show that the amount of light received during a 70-day period, from a few days before flowering of the first truss to the time the ninth truss is in flower, has a direct effect on the yield from those trusses. The graph at Fig. 1 shows the yield that could be expected from the light received.

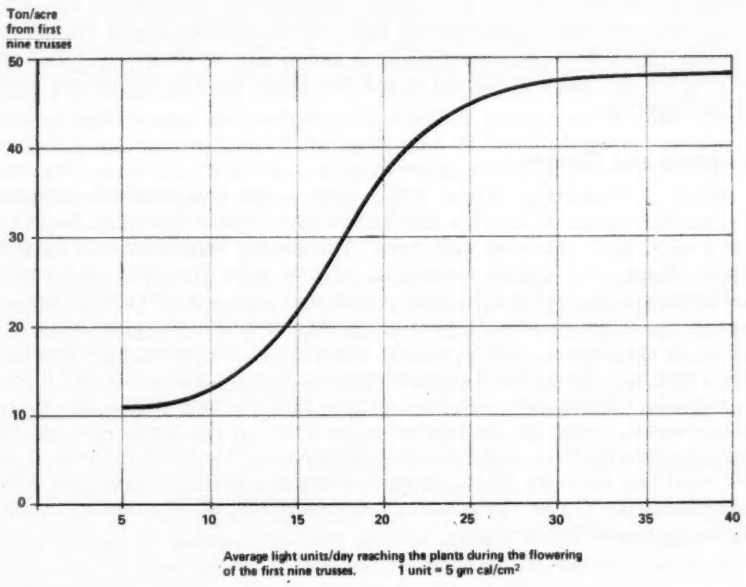


Fig. 1

A grower knowing the average light in his locality, the light transmission of the cropping house and the temperatures at which the crop is grown can estimate the best date for the flowering of the first truss. A decision then has to be made whether it is better to programme for an early yield, taking the risk that light may be below average and expecting to reap the advantage of high early prices, or to choose a late date which gives a faster bulking rate with rather lower prices. Table 3 is a guide to growers in different parts of the country who wish to balance good early yield with reasonable prices. In equity terms this would be the same as investing in moderate to low risk shares. Modern glass is defined as a metal structure wide span and old glass as a timber vinery orientated east–west with 24 × 24 in. glazing.

Table 3

Growers' guide to balance early yield with reasonable prices

Situation:	South Coast		Lea Valley		Yorks W. Riding	
Type of glass:	modern	old	modern	old	modern	old
Date of first flower:	1st Feb.	14th Feb.	10th Feb.	24th Feb.	20th Feb.	3rd Mar.

By following the above schedule it can be expected that well-managed crops grown in average light conditions would yield in the region of 38 tons per acre by the end of the tenth week of picking. For tomato growers it appears that the best solution currently available is to accept the natural light transmitted to the crop after the first flower. Time taken in propagation will vary according to whether supplementary light is given or temperatures are higher or lower than those recommended by A.D.A.S. For this reason the date of sowing will vary considerably between growers programming for the flowering dates suggested.

Lettuce and flowers

Work at Stockbridge House E.H.S. with winter grown lettuce is establishing that values of less than one unit of extra light is hastening maturity by a week and improving uniformity. Lettuce has been shown to have a high efficiency of energy conversion at low light intensities and small differences in glasshouse light transmission may have considerable economic advantages with this crop. Unfortunately, there is little information available about flower crops in relation to light transmission. Flowering right through the winter, as is done with year-round chrysanthemums, carnations and roses, is a totally different situation from tomato programming. Crops like chrysanthemums, where all the flowers are initiated at the same time, would possibly benefit from supplementary illumination for short periods. It is intended that when the Efford tomato experiments described here have been completed, the various designs of glasshouse will be used to investigate the light response of flower crops.

Appointment of New Secretary at the Agricultural Research Council

Professor Sir Ronald Baskett, O.B.E., D.Sc., F.R.I.C., has been appointed Secretary of the Agricultural Research Council in succession to Sir Gordon Cox, K.B.E., T.D., D.Sc., LL.D., F.Inst.P., F.R.I.C., F.R.S., who retired at the end of September. Sir Ronald Baskett's appointment, which will be for one year, took effect from 1st October, 1971.

Sir Ronald Baskett was Professor of Agricultural Chemistry at Queen's University, Belfast, from 1935-59 during which period he also served, from 1947-59, as Chief Scientific Officer, Ministry of Agriculture for Northern Ireland. From 1950 to 1952 he was Agricultural Attache at the British Embassy, Washington. From 1959-67 he was Director of the National Institute for Research in Dairying. He is a member of the Meat and Livestock Commission's Research Advisory Committee and is also Chairman of the Commission's Animal Production Panel.

The European and Mediterranean Plant Protection Organization reaches its 20th anniversary.

Twenty Years of E.P.P.O.

Dr. M. Cohen

THE Colorado beetle is probably one of the insects most widely known to the general public if only because its portrait and the dangers of its establishment are displayed in so many places. Its spread in Europe during the 1939–45 war led to the setting up in 1947 of the International Colorado Beetle Committee (I.C.B.C.), an informal arrangement between some of the western European countries, including Britain. In the years following, the I.C.B.C. took concerted action to control the pest where it occurred and to prevent its spread to countries that were still free of infestation. The success of this limited international co-operation stimulated the participants to think about widening activities to cover other pests (and diseases) of plants and plant products, especially those causing interference in international trade, including that in stored products.

Wider international action

In January 1950 the I.C.B.C. was renamed the European Plant Protection Organization, and in April of that year a draft Convention was drawn up to put the Organization on a formal international basis. Agreement was rapid, and in April 1951 the Convention was signed in Paris and the name changed to European and Mediterranean Plant Protection Organization—E.P.P.O. Almost simultaneously F.A.O. drew up its International Plant Protection Convention, which was signed in Rome by many countries from both hemispheres, and E.P.P.O. was recognized as the regional plant protection organization for the European and Mediterranean area.

Starting off with 15 member countries out of the 36 that were invited, E.P.P.O. had 22 members by 1955 and the success of the Organization is shown by the fact that in 1971 it has no less than 31 member countries, including the U.S.S.R. and six other eastern European countries.

Role of E.P.P.O.

Over the years the main effort of E.P.P.O. has been centred on keeping out of Europe the pests and diseases of real phytosanitary importance that have either not yet reached the Continent or are present only in limited areas. It strives to advise member countries on the scientific, administrative and legislative measures needed to prevent the introduction and spread of dangerous pests and diseases of plants and plant products so as to facilitate rather than hinder international trade. Its aim has been to secure simplification and unification of regulations and certification amongst its members.

The Organization moves with the times, and in recent years has increased its activity in the field of technical conferences and training courses for the phytosanitary services of member countries and has greatly improved intelligence and documentation services. Quick to recognize the implications

for phytosanitary activities of rapidly developing procedures, it has turned its attention to the problems of containerized transport, mass production of planting material and the increasing interest in environmental pollution to which the use of pesticides for the control of crop pests and diseases makes some contribution.

E.P.P.O. owes much to the enthusiasm and foresight of those who have served as Director-General. The first of these and the man who really set the Organization on its feet was Dr. V. E. Wilkins who came from the British Ministry of Agriculture, Fisheries and Food. He was followed by Professor I. Granhall of Sweden who in turn was succeeded by Dr. W. F. Darke, again from Britain. The present Director-General is Dr. G. Mathys of Switzerland.

E.P.P.O. is an international organization with real rather than paper successes, even though it can act only in an advisory capacity. Changes in European and international situations will provide it with further challenging problems which, on the basis of its past performance, it will undoubtedly solve.

M. Cohen, M.Sc., Ph.D., F.I.Biol., is the Director of the Ministry's Plant Pathology Laboratory, Harpenden.

Safe Gun Handling

Every year there is a regular and unnecessary toll of deaths and serious injuries on farms as a result of shooting accidents, most of which are caused by careless or inexperienced handling or defective guns. Many of these accidents occur when farmers or farm workers take their guns with them while they are out working on the land. Children, too, are often the victims of careless gun handling; already this year a thirteen-year-old boy has been killed while carrying a loaded gun.

Several deaths have occurred because loaded shotguns have been carried on tractors or other farm machines. This practice is not only foolhardy but extremely dangerous. Whenever a gun has to be carried on a tractor, combine or other vehicle it is vital that it is unloaded.

If obstacles have to be negotiated when carrying a gun the cartridges must always be removed first; the effectiveness of the safety catch should not be relied upon. Accident reports clearly show that to attempt to cross a fence or a hedge with a loaded gun is very dangerous.

Contrary to popular belief it is not sufficient just to open the gun and leave the cartridges in; neither is it safe, with some old hammer guns, to let the hammers down. A gun with a faulty firing mechanism may go off if it is dropped, and a hammer can catch on twigs, branches or nails and be pulled back sufficiently for it to strike and fire the cartridge. Some hammerless guns have been known to go off even when the safety catch was on, because of a fault in the internal mechanism that the user knew nothing about.

Before aiming a gun the marksman must make absolutely certain he can see where he is intending to shoot and that no one is in the line of fire; he should never shoot blindly into a hedge, a wood, or anywhere where other people might be.

A gun must always be treated as if it is loaded. It must be kept well maintained and in a safe condition. If there is any doubt at all about this it should be overhauled by a competent gunsmith and proof-tested.

It should be remembered that a .410 shotgun is just as lethal as a 12-bore; it has practically the same pressures and velocities; although there are less than half the number of pellets in a .410 cartridge, any of these can kill. Just because this gun is smaller and lighter it is not a learner's weapon.

Children are naturally inquisitive and seem to have an inherent interest in guns. For this reason a loaded gun must never be stood in a room to which children have access. Guns and cartridges should, as a matter of habit, be placed in a safe place immediately after use, preferably somewhere that can be locked up.

If these commonsense rules are followed, marksmen will not only continue to enjoy their sport but they will also help to *Keep Farming Safe*.

Menai road bridge linking Anglesey with Caernarvonshire

1. Anglesey

I. W. Jones

THE Isle of Anglesey, originally known as Mona, which persists in the Welsh name Mon, is the most northerly of the Welsh counties. It is separated from the mainland by the narrow Menai Straits whose currents, swift and treacherous, are feared by sailors. The approach scenery around the Menai Bridge is extremely picturesque and the straits add to the coastal beauty of Anglesey with its rocky outline well indented with numerous bays and coves.

To the visitor who has just passed through mountainous Snowdonia, Anglesey appears very flat. It is, in fact, a rolling plain with only a very small area above the 300 feet level. The climate is generally kind and the influence of the Gulf Stream maintains a regular temperature without extremes. Snow seldom falls and does not persist. High temperatures in summer are tempered by sea breezes. The main climatic problem is the exposure to high winds as there is little natural shelter within the island.

Grazing economy

The climate, together with the soil types, which include some requiring underdrainage, favour a grassland economy. The natural aptitude of the island farmer is towards livestock grazing and grassland management and in this the long growing season is an added inducement. Cattle fattening on grassland has therefore become the main farming enterprise on the island.

The larger farmer depends almost entirely for his living on the grass feeding of strong store cattle which are bought mainly during February and March.

After a settling in period in yards and a run out in a paddock on supplementary feed of hay or silage, they are turned out to pasture in late March and early April to be sold fat from June onwards. The cattle are replaced by another set of animals and it is normal to turn over two and a half sets of animals in a season on the same land. Fertilizing and density of stocking are of paramount importance to successful grass beef production.

The system is costly because strong store cattle are expensive now and in short supply and great demand. Although a large number are produced on the island the supply has to be supplemented by importations of at least twenty thousand a year from Eire as well as large numbers from the mainland. An accepted variation nowadays is to take a silage crop after the first lot of cattle for use in late autumn to hold fat cattle until January or for store cattle in the winter. The topped pastures provide valuable clean autumn grazing. On the smaller farm the system of beef production is to take the calf through from birth to slaughter but this still depends on grass to complete the final fattening.

Other farming

Although there is a steady decline in the number of milk producers in Anglesey the quantity of milk produced remains steady. A notable feature is the fact that half the dairy cows are on farms of less than 50 acres.

Fat lamb production is a supplementary enterprise on beef and milk producing farms. The normal pattern is to cross the Welsh draft ewes from Snowdonia with Suffolk rams and to sell the lambs in June and July. There is competition coming from the Welsh Half Bred ewes which possess management advantages over the smaller Welsh ewe. Total production from pastures is increased by the judicious rotation of sheep and cattle.

The island is noted for its healthy weaner pigs which are produced on the smaller farms. The bulk is absorbed by the producer-controlled fattening unit which has a favourable effect on weaner prices in the area.

Arable crops, which are limited to cereals and potatoes, are a very important element of production on some farms although the acreage involved is only a fraction of the total. Rotational husbandry is the usual rule with a fairly long grass break.

Egg production is geared to meet the demand of the tourist trade but the total production by individual farmers is now dwarfed by a 112,000 a week integrated broiler unit which has been established in the County.

Industrial development

Until five years ago there was little industrial development in Anglesey but recently many large scale projects have materialized. The largest atomic power station in the world has just come into production on the north coast and in its wake the Rio Tinto Zinc Aluminium Smelter has been established at Holyhead. Bromides are distilled from the ocean at Amlwch and the latest venture planned is the Shell Oil Company Terminal project off the north-east coast. In spite of these changes the countryside remains distinctly rural and very attractive to the many visitors who come into the area every summer.

Llangefni, in the middle of the island, is the administrative centre for the county besides being a very busy agricultural market town. Holyhead, situated at the terminus of the A5 highway to London, contributes greatly to the economy of the country, with its busy Irish sea services to Dublin and

Belfast, which carry 1,250,000 passengers a year and a car ferry that transports 60,000 cars a year. British Rail are spending £8 million on modernizing the port for container and 'drive in' traffic. The rail and boat link also carry 156,000 store and beef cattle every year. The bulk of these are sent by rail to all parts of England and Wales, leaving about 20,000 destined for Anglesey farms.

The people

Anglesey is Welsh in all aspects and its people have a distinctive insular character. They are blessed with a unity of purpose and excel in successful co-operation. Notable examples are their Ploughing Society, Grassland Society and particularly the Agricultural Society with its large and loyal membership whose two-day show is regularly crowned with success.

In spite of a great scarcity of agricultural labour it is greatly to the credit of the farmers of Anglesey that their production expands from year to year.

Ministry Publications

Since the list published in the September 1971 issue of *Agriculture* (p. 418) the following publications have been issued.

MAJOR PUBLICATIONS

TECHNICAL BULLETINS

No. 24. The Significance of Winter Rainfall over Farmland in England and Wales (New) 45p (by post 49½p) (SBN 11 240884 2)

OUT OF SERIES

Experimental Horticulture No. 22 (New) 40p (by post 42½p) (SBN 11 240812 5)

FREE ISSUE

ADVISORY LEAFLETS

No. 350 Winter Cabbage and Savoy (Revised)
No. 351. Summer and Autumn Cabbage (Revised)
No. 408. Kale as a Feedingstuff (Revised)
No. 576. Insect Pests of Brassica Seed Crops (New)

SHORT TERM LEAFLETS

No. 35. Atmosphere Control in Fruit Stores (Revised)
No. 131. Horticultural Sprayers for Small Areas (New)

N.A.A.S. ADVISORY PAPERS

No. 2. Composition of Organic Manures and Waste Products used in Agriculture (Revised)
No. 6. Basic Slag (Revised)
No. 8. The Value of Ground Rock Phosphate as a Fertilizer (New)

UN-NUMBERED BOOKLET

Bee Health and Bee Keeping 1970 (New)

Priced publications are obtainable from Government Bookshops (Addresses on p. 464) or through any bookseller. Single copies of free items are obtainable from the Ministry of Agriculture, Fisheries and Food (Publications), Tolcarne Drive, Pinner, Middlesex HA5 2DT.

The Pilkington Report 1966 established new trends in

Agriculture Diploma Courses

A. G. Healey

MOST farmers and growers will have heard of the new Higher National Diploma and Ordinary National Diploma courses offered in agriculture, horticulture and poultry husbandry. There still seems to be, however, some confusion about these courses and qualifications and their relationship to the old, long-established National Diplomas. What follows is a factual account designed, hopefully, to clarify the situation.

The new courses were established as the result of the report of the Advisory Committee on Agricultural Education, issued in 1966. The Chairman of the Committee was Sir Harry Pilkington, as he was then, and the report is still known popularly as the Pilkington Report. The Advisory Committee were asked to consider:

> 'The present position of, and future requirements for, full-time further education for agriculture in institutions other than Universities, with special reference to courses above the level of the one-year certificate courses.'

In practice the Committee confined themselves to courses at diploma level, referring only to a limited extent to part-time and one year certificate courses. This deliberate omission has now been compensated for by the recent appointment of a Committee set up under the Chairmanship of Professor J. P. Hudson to consider agricultural education below diploma level.

The Sponsors

As a result of the Pilkington Report, the Department of Education and Science set up a Committee to implement the recommendations of the Report, so far as they were accepted. Represented on the Committee are the Unions—National Farmers, Ulster Farmers, Agricultural Workers (in association with T.G.W.U.)—the Royal Agricultural Society of England, the Royal Horticultural Society, the Institute of Agricultural Engineers and the Ministry of Agriculture for Northern Ireland. Other members are drawn from teachers' organizations and the Training Boards for agriculture and local government. The Chairman is Mr. E. M. Owens, J.P., a past Chairman of the Development and Education Committee of the National Farmers' Union and a well-known Somerset farmer, who was also a member of the Pilkington Committee. Following the pattern of industry generally, in which similar bodies controlling H.N.D. and O.N.D. qualifications already exist,

the new Committee became known as the Joint Committee for National Awards in Agricultural Subjects.

Subject Committees

The Joint Committee has found it necessary to break down responsibility for courses into four subjects, each subject being served by a separate sub-committee, i.e.,

Agriculture	Commercial Horticulture
Poultry Husbandry	Amenity Horticulture

In addition, courses have begun, or are being considered, in forestry and farm mechanization. The first courses, started in the academic year 1969–70, are now well established and appear to be working satisfactorily; the first diplomas will be awarded in the summer of 1972.

Special features

There are some features about the new structure which warrant particular mention. Each college has to be approved by the Department of Education and Science as a suitable centre. It is then required to submit a detailed scheme showing how the proposed course would function. Each scheme is scrutinized closely by the specialist sub-committee involved and, where necessary, amendments are suggested and are usually accepted. The system is designed to ensure, within the framework of the national award, that each College has the maximum freedom to teach its subject in its own way and in accordance with its own traditions, using fully the local advantages of climate and soil.

To ensure that national standards are properly maintained the Joint Committee appoints an assessor for each College, in consultation with the College and according to his knowledge of farming or growing in the area. These assessors are responsible to the Committee. They visit their College at frequent intervals, assist in the continuous assessment of students, moderating marks for written examinations and generally exercising an overall and friendly supervision of the course, but without acting as examiners. In addition to these local assessors, each teaching establishment has an educational assessor who serves a number of Colleges and is thus able to maintain an even standard between one establishment and another. The two assessors work closely together.

The use of continuous assessment is considered very important. No longer does an award depend entirely upon a student's performance in a final examination, sometimes under artificial conditions imposed by special preparation. Under the new system a student acquires credit, in the form of marks, as he proceeds from stage to stage through his course, with increasing weight being placed on assessments gained towards the end when an integration of what has gone before can be achieved.

A further feature of the new courses is the emphasis on practical experience. This is obtained not only by the long established pre-entry practical experience on a holding but also by a sandwich period, or periods, usually amounting in total to a year. The sandwich period, which in most, but not all, cases comes in the middle of the three years of the course, is spent on selected farms or holdings and is supervised by the College staff working in close conjunction with the employer.

Aims and ambitions

The Higher National Diploma courses are designed to produce technologists in agriculture, horticulture and poultry husbandry. They are essentially science-based courses and the qualification is close to a pass degree level. The basic requirements for entrance are one Advanced level pass in an approved science subject, supported by evidence of having completed a further subject to advanced level, and a minimum of four 'O' level subjects, including mathematics.

The Ordinary National Diploma courses aim at producing technicians; for these the entry qualifications are lower, consisting of a minimum of four 'O' levels, two of which must be from a science and mathematics group and one from a group of subjects designed to test the use of English. There are other approaches to O.N.D. courses, including entry through City and Guilds and the National Certificate examinations.

Discussions are now taking place on supplementary courses probably, but not necessarily, of one-year duration, to follow H.N.D. and O.N.D. courses. The Joint Committee are well aware, however, of the need to produce worthwhile technologists and technicians to serve the industry without unnecessarily prolonging the period of time spent in formal learning.

Whither now?

Some obvious questions are now being asked about the new courses and qualifications. What is going to happen to the young people when they qualify at these levels? And what sort of jobs will they get from 1972 onwards?

It is very difficult to give satisfactory answers to questions like these but it is hoped that holders of Higher National Diplomas will serve the industry as farmers, growers and managers of large concerns and also serve in the ancillary industries as technical representatives. It is also expected that holders of such Diplomas, probably after satisfactorily following a post-H.N.D. course in such subjects as management or mechanization, will be accepted for teaching and advisory posts in the same way that holders of National Diplomas have been accepted hitherto. The holders of Ordinary National Diplomas will form the skilled technicians of the future in a highly mechanized and sophisticated agricultural and horticultural scene, with some going on to manage or farm on their own.

With the exception of the examinations for the National Diploma in Horticulture, which the Royal Horticultural Society will continue to offer, the National Diplomas in Agriculture and in Poultry Husbandry are now being phased out and the last awards will be made in 1973.

Colleges and courses

In conclusion, a list is given opposite of courses offered at the time of writing, in a range of subjects. College and Institute Principals will be glad to advise students and parents on matters concerning training and education. Further information is given in the booklet *Agriculture Education**.

*Obtainable from Department of Education and Science, Curzon Street, London, W.1., or Ministry of Agriculture, Fisheries and Food (Publications), Tolcarne Drive, Pinner, Middlesex HA5 2DT.

Higher National Diplomas

Agriculture

Essex Institute of Agriculture

Harper Adams Agricultural College (Shropshire)

Lancashire College of Agriculture

Royal Agricultural College (Gloucestershire)

Seale Hayne Agricultural College (Devon)

Welsh Agricultural College (Aberystwyth)

Horticulture

Essex Institute of Agriculture

Ordinary National Diplomas

Agriculture

Askham Bryan College of Agriculture and Horticulture (Yorkshire:West Riding)

Lancashire College of Agriculture

Lindsey College of Agriculture (Lincolnshire)

Berkshire College of Agriculture

Monmouthshire College of Agriculture

Brooksby Agricultural College (Leicestershire)

Shuttleworth College (Bedfordshire)

Essex Institute of Agriculture

Shropshire Farm Institute

Hadlow College of Agriculture and Horticulture (Kent)

Welsh Agricultural College

Lackham College of Agriculture (Wiltshire)

Horticulture

Askham Bryan College of Agriculture and Horticulture (Yorkshire: West Riding)

Hadlow College of Agriculture and Horticulture

Essex Institute of Agriculture

Lancashire College of Agriculture

Hertfordshire College of Agriculture and Horticulture

Merrist Wood Agricultural College (Surrey)

Pershore College of Horticulture (Worcestershire)

Poultry

Harper Adams Agricultural College

Forestry

Cumberland and Westmorland College of Agriculture and Forestry

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This article has been contributed by **A. G. Healey, N.D.H.**, a member of the Joint Committee for National Awards in Agricultural Subjects.

in brief

- **Hedgerows in perspective**
- **The fat and the lean**
- **Potatoes—with care**

Hedgerows in perspective

In the past few years the word 'hedges' has acquired a distinctively emotional significance as certain areas of conservationist interest have alerted public opinion. Like most controversies, the real need is to get the subject into its true perspective—in this case to reappraise the real usefulness of hedgerows in a purely farming context whilst accepting the need to preserve both amenity and a natural habitat for certain species of fauna and flora. In a countryside largely sculptured by man, the hedgerows and their associated hardwood trees have been the means of imprinting a chequer-board pattern across the face of Nature. They arose not out of the fulfilment of any aesthetic ambitions but from the calculated enclosure movements which opened up the horizons of farming from a shallow subsistence to the wider vistas of commercial enterprise. Indeed, evidence is not lacking that the later hedgerow planting by landowners went to excess since, in order to preserve the game to which they gave shelter and a privileged sport for the few, tenant farmers were increasingly forbidden to cut back or trim them. Thus the hedges tended to encroach on the farmer's land and hares and rabbits were encouraged to multiply and feed on the adjoining crops. No wonder, therefore, that in face of the Game Laws of the eighteenth and nineteenth centuries the poaching war of the squire versus the rest was aided and abetted by the majority of farmers.

The situation today is that of the 600,000 miles of hedgerows in the United Kingdom, some 500,000 are on agricultural land, not a little of it dividing up areas into fields too small for the modern conception of efficient farming practice. Since the end of the war hedgerow removal has been estimated to be proceeding at the rate of some 4,500 miles a year—rather less than this since the 1962–66 peak period. Because of lack of labour much of this had deteriorated into unsightly and gappy growth, having neither agricultural nor amenity value. But if some has been taken, much abides, and new understanding between farmers and conservationists is emerging in a national interest that must be seen to operate in a full and not a partisan sense. A report of the Joint Shelter Research Committee, made earlier this year (and which incidentally can be obtained free from the Ministry of Agriculture, Tolcarne Drive, Pinner, Middlesex) ought to be studied closely by all who have a concern in the hedgerow controversy. It fairly assesses the value of hedgerows to day and their probable place in the rural scene of the future.

The fat and the lean

Consumer prejudice against animal fat, which has revolutionized the theories and practice of farm stock breeding and husbandry and is steadily turning us into a nation of Jack Spratts, finds a number of echoes in the present programme of the Meat Research Institute. One of these is the clearly important need for a cheap, quick and reliable method of assessing the lean to fat ratio in any given carcase, particularly of cattle and sheep (fairly satisfactory procedures are already in use

with pigs). The answer, derived from M.R.I. experiments and reported in their Annual Report for 1969–70, points strongly to the possibility of accurate visual assessment by a corps of specially trained inspectors using objective criteria. This has emerged as a result of carcase measurements and a series of related photographs presented at judging sessions compared with the determination of carcase composition based on complete dissection. Arising from this investigation it may be possible to devise a useful system of classification for beef and lamb carcases—say, into four or five classes, with perhaps some subdivision to cover other carcase characteristics. Assessment of conformation, muscle to bone ratio and the proportion of high priced cuts, however, has been found to be less reliable and will necessitate further work.

Belief that the full palatability of meat is dependent on a considerable proportion of fat, and particularly so in the marbling of beef joints to which certainly the palates of our more senior citizens continue to salivate, takes another knock from M.R.I. investigations. An initial project concerned with pork derived from pigs specifically selected for leanness has produced nothing to support the contention that eating quality suffered in this respect.

The physiological mechanism by which individual animals convert their food partly into muscle (i.e., lean) and partly into fat suggests some genetic control which, if better understood, might be manipulated to give the desired fat-lean ratio in the end product and lead to the provision of a better basis for genetic selection. This is another field of inquiry which the Institute is opening up.

The steady trend away from animal fat will obviously have its implications in human nutrition, one question being whether the composition of the lean meat would be likely to change, e.g., in vitamin or mineral content. On this point the report concludes that 'significantly lower fat content might perhaps lead to a significant difference in the composition of the fat, with a greater degree of chemical unsaturation (and hence greater tendency to develop rancidity) together with a softer physical consistency. But neither for lean, nor for fat, is there sufficient information to enable satisfactory prediction of the general nutritional consequences of a significant shift towards leaner animals. The M.R.I. is not working in this field but, since nobody is investigating it systematically, it is possible that it should be'.

Potatoes—with care

ANY campaign that promotes the marketability and consumer acceptance of a food product deserves all the support it can get. It is therefore to be hoped that potato growers and everyone in the chain linking field to retailer will be stimulated by the Potato Marketing Board's launching of S.P.U.D. (The Society for the Prevention of Unnecessary Damage). It will certainly have the backing of every housewife, who knows from personal experience the amount of potato waste that she has to put in the dustbin or on the compost heap. The P.M.B. estimates that as much as one-third of the potato harvest is damaged on the farm and another 12 per cent subsequently. If more care were to be taken the industry could save at least £5 million annually, says the Board. Maybe it is because the potato is such a commonplace article of food, formerly very cheap, and that it *appears* to be robust that carelessness in its handling has too often come to mean normal treatment. But potatoes are not so cheap that a housewife can afford to accept damaged tubers, and it is inevitable that defensively she should turn to alternatives, including processed foods that are both waste-free and save her kitchen time.

Inaugurating S.P.U.D., the P.M.B.'s Chairman, Mr. James Rennie, said that the remedy lies primarily with individual growers and machine operators. Techniques to avoid damage should be adopted from the earliest stage in the production cycle and followed by careful treatment and handling at all stages thereafter. Hauliers and shopkeepers must learn not to drop bags of potatoes, throw them around or trample over them—sound advice for a sound product.

Books

Farming, Fishing and Forestry. (Basic Studies in Geography Series). ERIC W. YOUNG. Edward Arnold, 1971. *85p.*

Farmers, and others of us concerned directly with farming, often benefit from a look at our industry from outside. The geographer's line of approach is quite different from our own, and although the facts are obvious and indisputable the conclusions drawn from them may be widely different. For this reason, the study of a simple geography text-book such as Mr. Eric Young's can be useful to us.

This is a simple and basic book, compressing into its sixty-six pages a wealth of information and illustrations. The photographs are adequate and well chosen, the statistical information clear and sometimes striking, and the special maps showing resources and human distribution illuminating. The text is clear, leading the reader to further investigation through questioning and directed study. Such is the degree of compression in the book, however, that its layout into smaller sections has to a large extent been sacrificed in order to make maximum use of the limited space.

The subjects covered in this short book are so immense that they can be given little more than superficial treatment. It proceeds from a survey of human needs to look at land use, farming methods, farming and market gardening systems, industrial crops and the soil itself. It proceeds to an examination of fishery practices, and concludes with a brief survey of forestry and forest products. This book will no doubt prove to be mainly of interest to teachers of rural studies and those concerned with fairly simple geography courses.

G.S.B.

Hammond's Farm Animals. J. HAMMOND, Jnr., I. L. MASON and T. J. ROBINSON. Edward Arnold, 1971, £3.

This is the fourth edition of the late Sir John Hammond's well-known book.

Whilst the new edition clearly follows the same line as previous editions, with its wide use of graphs, diagrams and photographs, it has had many new sections added. These additions bring the Hammond Cambridge course of lectures up to date and the new is interspersed with the old, leaving the pleasing character of the book intact.

The book is a great tribute to the number and quality of Sir John's post-graduate students who worked with him at Cambridge, and many of the experiments recorded were the fundamental findings which have stood the test of time and are still as important today as when the original work was done.

The revision of Part I has been carried out by J. Hammond, Jnr. and T. J. Robinson, whilst I. L. Mason, of the Institute of Animal Genetics, Edinburgh, re-wrote much of Part II.

Part I deals with the principles of reproduction and growth of horses, cattle, sheep, pigs and poultry. It still includes the account of the well-known classic Shire X Welsh pony reciprocal crossing experiment where the dam, when of the larger breed, produces offspring one and a half times heavier at maturity than when bred in the opposite way. Artificial insemination, the use of hormones and the transplantation of fertilized eggs bring the work up to date.

Part II, the genetics and breeding section, covers the breeding from Bakewell's time to the importation of the new Continental breeds of the present. A slight criticism could be levelled at the retention of too many references to the 1940-1950 era of British breed structure and to breeds which, since that period, have suffered a severe decline in numbers. References to killing cattle for beef at an early age in one section refers to animals of one and a half to two years, whilst in another the age for slaughter of intensively-fed cattle is brought up to date at twelve to fifteen months. It justs shows the changes which have taken place since the earlier editions.

Students of agriculture, lecturers, veterinarians and all interested in livestock will find this revision of great help and interest to them, and it should continue to stand the test of time and remain one of the most widely referred to text books on farm animals.

W.L.

Proceedings of the XIth International Grassland Congress. Edited by M. J. T. NORMAN. University of Queensland Press. (Agents: International Scholarly Book Services). *£13·95.*

The Proceedings of the International Grassland Congress are now widely accepted as one of the most effective sources of information on recent World developments in research, not only in grassland, but in many other aspects of soil, plant and animal science. The Proceedings of the XIth Congress, held in Australia in April 1970, worthily uphold this tradition, subject to one reservation—that the editors have allowed a series of important new contributions to be all but submerged by contributions of only parochial interest. The latter must of course be welcomed from countries where grassland research has only recently started but there can be less excuse for the high proportion of such papers from the host country, which contributed more than 40 per cent of the total.

The Proceedings include the full texts, with extensive tables and graphical material, of the eighteen plenary and 245 offered papers. The latter are grouped into broad sections dealing with natural grasslands; land development with sown pastures; plant improvement and seed production; plant nutrition and soil fertility; physiology of pasture and forage plants; pasture production and ecology; pastures and forages in animal nutrition; and management and use of pastures and forage crops. A novel feature of several papers is the use of mathematical simulation techniques, which are likely to be of increasing importance in interpreting ecological situations. Perhaps the most disappointing aspect is that in only the last two sections is research on animals reported—a reflection perhaps of the disinterest shown in most grassland problems by animal research workers.

However, the major omission in these Proceedings is a record of the reply made by Professor P. T. Thomas to the address of welcome to the delegates. This, a fantasia of improbable Welsh anecdotes, was to the reviewer the highlight of the Congress.

W.F.R.

Economic Aspects of Grain Maize Production in East Kent and East Suffolk in 1970. J. D. SYKES. School of Rural Economics and Related Studies. 40*p.*

Maize cannot succeed under marginal conditions. There is also need for a high standard of management with a close control of costs. This is the message of this interim report of progress in growing grain maize in two counties.

The report spotlights the penalties that are likely to be incurred where standards of production fall short of optimum. Relative inputs and outputs are studied from records of twenty-one farms on boulder-clay, sand and chalk soils. The causes and effects of low plant production, losses at harvest and other adverse factors are analysed. Examination of the rather high costs involved in various harvesting, drying and storage systems supports an appropriate warning that drying almost certainly presents the greatest technical bottleneck in grain maize production today.

Although the scale of this survey is too limited to offer a realistic perspective of the potentialities of the crop, even in southern counties, the report provides a valuable insight into the likely pitfalls in growing and handling the crop. It attempts to explain the reasons for a range of yield from 15 cwt to over 45 cwt per acre but in doing so it pin-points the need for much more detailed monitoring of crops in the field and the many gaps in knowledge that must be explored in order to provide greater reliability of yield from present day or future varieties of maize.

The report is available from Publications, School of Rural Economics and Related Studies, Wye College (University of London), Ashford, Kent.

R.G.H.

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Correction (p. 156): The telephone number of Doff Portland Ltd. is Hucknall 2842 (*not* Hucknall 2482 as announced in *Agriculture*, July 1971).

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